CHAPTER I

INTRODUCTION

1.1. Background

Nowadays, the necessity of composite material as the substituent of metal is dramatically increasing. It is because composite has a good mechanical property and corrosion resistant [1]. The applications of composite material its self have been conducted in several of aspects. The more advantages of composite than other can be seen in ship. A ship made of composite has good efficiency in fuel use due to its weight [2].

Polymer matrix composite is one kind of composites that grows highly in use but most of the polymers used for the composite are synthetic polymer. It cannot be degraded by bacteria so that those raise environmental problem such as soil pollution. Furthermore, it emits carbon dioxide (CO_2) to the air if burning is conducted.

The growing environmental awareness and new rules and regulations are forcing the industries to seek more ecologically friendly materials for their products. Automotive applications based on natural fibers with biopolymer as matrix material are very common today [2]. The other developing is a packaging that is made eco-friendly material.

One of the renewable materials is Polylactid Acid (PLA). PLA is one of the first commodity polymers produced from annually renewable resources with degradable properties comparable to many petroleum-based plastics. Moreover, it has some problems. The problems with this polymer are that it has been poor commercial availability, brittle, and high price. The long-term properties of renewable materials are also very important especially if the products are not single use applications [2].

The effort to repair the mechanical property is by making composite. PLA can be a matrix polymer for the composite. It can be mixed with natural fiber. By mixing it with natural fiber, its eco-friendly properties still exist rather than mixing it with synthetic polymers.

Natural fibers have many advantages compared to synthetic fibers due to having low weight, and recyclable and biodegradable properties. They are also renewable and have relatively high strength and stiffness and cause no skin irritations [3]. On the other hand there are also some disadvantages such as its moisture uptake, quality variations and low thermal stability properties.

Many investigations have been made on the potential of the natural fiber as reinforcements for composites and in several cases. The results have shown that the natural fiber composites own good stiffness but the composites do not reach the same level of strength as glass fiber composites [3]. That is why the researchers have trying harder to develop the natural fiber composite.

One of fibers that is used as the reinforecement of composite is kenaf fiber. Kenaf fiber is a fiber that is easily found in tropical countries like Indonesia but it is not maximized yet in use. Kenaf (Hibiscus cannabinus L.) is a traditional, third world crop after wood and bamboo that is poised to be introduced as a new annually renewable source of industrial purpose in the so-called developed economics.

A previous research on kenaf fiber discussed about the mechanical properties of composite if laminated kenaf form that was treated. Like Lee's research (2009), that investigated the woven kenaf that was used as the the matrix of PLA in composite. The result was satisfied and was applied as car's body material.

Another research T. Nishino (2003) about the composite PLA/woven kenaf fiber gave the satisfied result as well. He got the tensile stress about 62 MPa but it was too hard and taking much time to produce a woven kenaf. Even less to make a laminated kenaf like Lee found.

Therefore, based on the reasons above, this research will concern about a composite that is made by kenaf powder (short discontinues fiber) as the reinforcement and PLA as the matrix. By using kenaf powder, it is expected that the composite will have the same properties besides make the production become efficient. It will also find out that is any effect by adding the kenaf powder as reinforcement in PLA matrix to its tensile and thermal-stability properties. It is expected that the work can obtain a new material in bio-composite base more efficiently.

1.2. Objectives

The objectives that want to be achieved from this research are listed as follow:

1. To obtain PLA/kenaf material with optimal tensile strength regarding to kenaf fiber addition.
2. To obtain PLA/kenaf material with high thermal-stability properties regarding to kenaf fiber addition.

1.3. Benefits

The benefits of this research are listed as follow:

1. To obtain a new material (composite base) by using a natural fiber especially kenaf fiber.
2. To be a reference for future research specifically in bio-composite.

1.4. Limitation of Problems and Assumptions

The limitation of problems of this are:

1. Fiber that is used in making composite is in short-discontinues form
2. Matrix that is used in making composite is Polylactid Acid (PLA)
3. Testing that is going to be conducted is tensile testing and thermal testing

Assumptions for the research are:

1. The distribution of fiber is random
2. Mechanical properties of the composite are uniform.

1.5. Systematical of Report

Generally, systematical of report consists of five chapters and some appendices. Chapter I is introduction that explains about background, objectives, benefits, problem scopes, and systematical of writing of report. Chapter II is literature review that concerns about theory related to research that will be conducted. Chapter III is methodology that contains schematic of working, tools, materials, and the procedure that will be conducted in the research. Chapter IV is results and discussions. Chapter V is conclusion and suggestion.